



To Enhance Soil Stabilization by Using Plastic Waste

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Abstract - Soil stabilization could be a method of improvement of the physical and Engineering properties of soil, like increasing bearing capability, shear strength, etc. which may be utilized by dominant compaction or addition of appropriate blends like cement, lime and waste materials like ash, Plastic bottles etc. Recently, the utilization of plastic product, like polythene (PE) bottles and polypropylene (PP), has been considerably increased, which can cause several environmental problems. Therefore, it's vital to seek out strategies to manage these waste materials while not inflicting any ecological hazards. one in every of these strategies is to use plastic wastes as soil device material. This new technique of soil stabilization may be effectively wont to meet the challenges of society, to cut back the quantities of waste, manufacturing helpful material from non-useful waste materials. The impact of the stabilization was evaluated through polishing off normal laboratory tests. The take a look ats embrace normal compaction test, Unconfined compressive take a look at (UCS), triaxial shear take a look at, CBR etc. Plastic like searching luggage is employed to as reinforcement to perform the CBR studies whereas commixture with soil for rising engineering performance of sub grade soil. Plastic strips obtained from waste plastic were mixed indiscriminately with the soil. A series of California bearing quantitative relation (CBR) tests were allotted on indiscriminately strengthened soil by varied proportion of plastic strips with completely different lengths and proportions.

Keywords: - PLASTIC BOTTLES, CBR, COMPACTION, TRIAXIAL SHEAR TEST.

1. INTRODUCTION

Stabilization is the technique of improvement of soil capacity and some methods applied for modifying the properties of soil for engineering performance. Soil stabilization techniques always prefer to increase the soil capacity. Some material such as cement, lime and fly ash are main component of soil stabilization techniques. Methods of soil stabilization may be grouped under two main types: (a) Modification of soil properties of existing of admixture, and (b) Modification of properties occur at fix proportion stabilization materials. The soil stabilization technique is the system of improve the bearing limit of soil utilization of controlled compaction, proportioning additionally the option of reasonable admixture or stabilizer is used as soil adjustment or "The strategy for improving the building properties of soil by embracing different adjustment procedure is named as soil adjustment". In these techniques of soil

stabilization, the soil is treated in such manner so as to improve its physical conditions or properties to make it more stable and durable. Soil stabilization becomes necessary when a highway and any type of structure is required to be built over weak soil or poor bearing capacity. It is a necessary part of increase the durability and stability of the structure and building. Soil stabilization is segregate some impurities from the soil; we get good outcomes for our construction work. So, it is very good technique to makes strong compressive strength, bearing capacity to protect soil from failure. Therefore, in present study stabilization of soil is reviewed by using locally available plastic waste products of plastic bottles are used in stabilization of soil in the form of strips of suitable dimensions. The objective of this study was improving properties of soil in economical way and reducing environmental pollution, and minimizes the problems of plastic waste disposal.

1.1 METHODS OF SOIL STABILIZATIONS

1. Mechanical Methodology of Stabilization:

During this procedure, soils of various gradations area unit mixed along to get the specified property within the soil. This could 2 be done at the location or at another place from wherever it is often transported simply. The ultimate mixture is then compacted by the same old strategies to urge the desired density.

2. Additive Methodology of Stabilization:

It refers to the addition of factory-made merchandise into the soil, which in correct quantities enhances the standard of the soil. Materials like cement, lime, bitumen, ash etc. area unit used as chemical additives. Generally, totally different fibers are used as reinforcements within the soil. The addition of those fibers manifest itself by 2 methods

- a) Orienting fiber reinforcement: The fibers area unit organized in some order and every one the fibers area unit placed within the same orientation. The fibers area unit ordered layer by layer during this sort of orientation.
- b) Random fiber reinforcement: This arrangement has separate fibers distributed haphazardly within the soil mass. The blending is finished till the soil and also the reinforcement kind a lot of or less uniform mixture. Materials utilized in this kind of reinforcements area unit typically derived from paper, nylon, metals or alternative materials having varied physical properties.

2. Literature Review

i) Tarun Kumar (et.all) ⁽²⁰¹⁸⁾

This study is carried out on the development of the roadways which is very important and required to be strong enough to support different loads. To meet these challenges plastic wastes are used in the forms of strips of various sizes for identifying the required percentage amount of plastic strips and providing the alternative way for disposing the plastic wastes. To study this reinforcing effect of mixed plastic strips in soil, a series of standard proctor and unsoaked CBR tests have been conducted and based on this it is observed that the maximum dry density of plastic mix soil decreases with increase of percentage of plastic strips, and for CBR increases with increase of percentage of plastic strips within a certain limit. Based on this conclusion should be drawn is that by increasing the amount of plastic contents, the value of the MDD decreases whereas the value of OMC increases. There is increase in CBR value for soil with increasing the percentage of plastic strips. The maximum CBR value is obtained when the percentage of the plastic strips is 0.8% of dry weight of soil. Hence 0.8% of strips having length of 2cm is considered as required amount.

ii) Sayli D. Madhavi (et.all) ⁽²⁰¹⁷⁾

This study reviews the experimental program conducted for stabilization of black cotton soil in the Amravati, a Capital of newly formed Andhra Pradesh state. They performed series of CBR testing's to find out optimum amount of plastic content is required for obtaining maximum CBR value. It can be concluded that CBR percentage goes on increasing up to 4% plastic content in the soil and there on it decreases with increasing the plastic content. For the construction of any civil engineering structure the foundation is very important as it supports the structure and to achieve this strength stabilization of soil is required. Soil stabilization is done by addition of suitable admixtures like cement, lime, sand, fly ash. It is required to incorporate the new techniques of soil stabilization which can be effectively used to meet the challenges of society, to reduce the quantities of the waste and producing useful material from the non-useful material which cannot easily recycled.

iii) Sharan Veer Singh (et.all) ⁽²⁰¹⁷⁾

This paper focus on the soil stabilization by using plastic waste products. The plastic inclusion can improve the strength thus increasing the soil bearing capacity of the soil. Uses of plastic waste as reinforcement which reduces the disposal problem of the waste materials. Infrastructure is a major sector that propels overall development of Indian economy. For any Structure foundation has the prime importance, the strong foundation plays very important role. An expansive soil such as black cotton soil creates problems in foundation and for this stabilization of soil is required.

iv) **Kiran Kumar Patil (et.all)**²⁰¹⁷

Stabilization of soils is an effective method for improving the properties of soil. The main objective of any stabilization technique used for increasing the strength and stiffness of soil, workability and constructability of the soil. Plastic such as shopping bags is used for reinforcing the soil for improving the various properties of soil. Applications of stabilizing of soil are increasing the shear strength of soil, bearing capacity of foundations and for improving the natural soil subgrade for construction of highways and airfields. In this they are used plastic bottle strips and plastic bag strips for stabilization. From this study conclusion made is there is increase in CBR value of a soil and maximum CBR is achieved when 0.75% amount of plastic bottle strips are added to the soil after further addition of the strips there is decrease in the CBR value. In case of plastic bag strips, it has been observed that 2% of the total weigh of the soil is the optimum proportion of the strips, we can also state from this study that strips cut out of plastic bottles are better option than strips of soil bags, to increase the CBR value of the soil.

v) **A. K. Choudhary (et.all)**⁽²⁰¹⁰⁾

Attempts have been made in this study to demonstrate the potential of reclaimed HDPE as soil reinforcement for improving engineering properties of the subgrade soil. Strips obtained from waste plastic with various dimensions were mix randomly with soil and find out appropriate amount of HDPE strips. They performed tests and interpreted the data based on the ratio of length to width of the strip

3. OBJECTIVE

- To determine shear strength of soil using triaxial test.
- To provide an alternative solution for the disposal of plastic waste.
- To provide an economical solution for soil stabilization using plastic waste.
- To determine the optimum plastic content to be used
- To increase the density and California Bearing Ratio (CBR) of soil using plastic as an admixture.

4. THE EXPECTED OUTCOMES ARE:

- Based on the review of the varied analysis paper we will conclude that plastic strips in optimum quantity with appropriate dimension is possible for raising the engineering properties of soil.
- Plastic is used collectively of the materials that may be used as soil stabilizing agent in correct proportion.
- Reducing the number of plastic waste and manufacturing helpful product from non-useful waste materials for property foundation and subgrade improvement.
- This new technique of soil stabilization is effectively wont to meet the challenges of society and it will considerably enhance the properties of soil utilized in construction of road infrastructure, foundation, stabilization of hill, pavement sub grade and alternative totally different fields as per the requirements and adaptability.

5. CONCLUSION

Based on the review of the varied analysis paper we will conclude that plastic strips in optimum quantity with appropriate dimension is possible for raising the engineering properties of soil. Plastic is used collectively of the materials that may be used as soil stabilizing agent in correct proportion of plastic should be there, that helps in increasing the cosmic radiation of the soil. Thus, victimization plastic as a soil stabilizer is economical and paid use in construction as there's lack of excellent quality soil for numerous constructions. Reducing the number of plastic waste and manufacturing helpful product from non-useful waste materials for property foundation and sub grade improvement. This new technique of soil stabilization is effectively wont to meet the challenges of society and it will considerably enhance the properties of soil utilized in construction of road infrastructure, foundation, stabilization of hill, pavement sub grade and alternative totally different fields as per the requirements and adaptability. Any large-scale analysis is better to work out the boundary effects influence on check and for its additional effectiveness.

REFERENCES

- 1) Tarun Kumar, Suryaketan, Joyanta “Behaviour of soil by mixing of plastic strips”, Maity Department of Civil Engg., Kolkata (IRJET) May – 2018
- 2) Sayli D. Madavi, Divya Patel, Mamta Burike “Soil stabilization using plastic waste”, Department of Civil Engineering, SRPCE, Nagpur (IJRISE JOURNAL) April – 2017.
- 3) Sharan Veer Singh, Mahabir Dixit “Stabilization of Soil by Using Waste Plastic Material: A Review”, International Journal of Innovative Research in Science, Engineering & Technology, ISSN(Online) 2319-8753, Vol. 6, Issue 2, February – 2017
- 4) Kiran Kumar Patil, Shruti Neeralagi “Soil Stabilization Using Plastic Waste”, International Journal of Advanced Technology in Engineering & Science, ISSN 2348-7550, Vol. 5, Issue No. 07, July 2017
- 5) A.K. Choudhary, J.N. Jha and K.S. Gill “A Study on Behaviour of Waste Plastic Strip Reinforced Soil” Emirates Journal for Engineering Research, 15 (1), 51-57 – 2010
- 6) S.K Khanna and C.E.G Justo, Highway engineering.
- 7) IS code (PART 2)-1967 Indian Standard Methods of test for Stabilized Soils, Determination of Moisture Content of Stabilized Soil Mixture.
- 8) Soil Mechanics and Foundation Engineering by Dr. K.R. Arora
- 9) Basic and Applied Soil Mechanics by Gopal Ranjan A.S.R. Rao

